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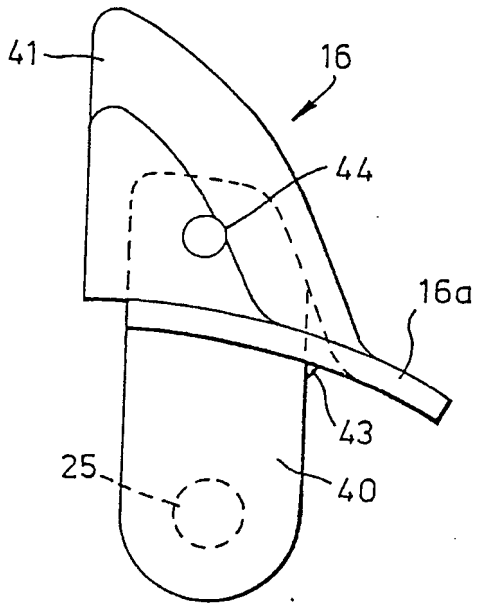

(57) Abstract

A tooth construction for a mineral breaker, having at least one breaker drum (14), the tooth construction (16) including a cover portion (16a) for extending over a portion of the drum surface, a spigot (18) for releasable retention in a complimentary pocket (19) formed in the drum (14), and at least one breaker tooth (16) protruding from said cover portion (16a).

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MINERAL SIZER

The present invention relates to a mineral sizer.

According to the present invention there is provided a tooth construction for a mineral breaker having at least one breaker drum, the tooth construction including a cover portion for extending over a portion of the drum surface, a spigot for releasable retention in a complimentary pocket formed in the drum, and at least one breaker tooth protruding from said cover portion.

Reference is now made to the accompanying drawings, in which:-

Figure 1 is a schematic perspective view of a mineral sizer according to the present invention;

Figure 2 is a schematic axial section through a breaker drum according to the present invention;

Figure 3 is a more detailed axial section through a pair of tooth support rings;

Figure 4 is a side view of a tooth support ring showing several teeth in position;

Figure 5 is a front view, partly in section, of one of the teeth shown in Figure 4;

Figure 6 is a side view of an alternative construction of tooth;

Figure 7 is a section along line VII-VII in Figure 6.

Figure 8 is a view similar to Figure 4 showing a further embodiment according to the present invention;

Figures 9 and 10 are respective side views of different tooth shapes.

Referring initially to Figure 1 there is shown a mineral sizer 10 having a pair of breaker drums 14 which are in driving connection with one another for rotation in opposite directions. In the illustrated embodiment the drums are intended for rotation so that the upper surfaces move away from one another so that material deposited on the drums is moved towards the sides of the mineral sizer. It will be

appreciated that, if desired, the drums 14 may rotate in the opposite fashion so that their upper surfaces move toward one another so that material is fed between the drums.

Each drum 14 is provided with a plurality of teeth 16 which are arranged in longitudinally extending rows 17, preferably each row extending along the drum to define a discrete helical formation (for example passing through 90 along the length of the drum). The rows 17 may, if desired, extend linearly along the drum and be substantially parallel to the axis of rotation.

The teeth 16 each include a cover portion 16a which together with the cover portions 16a of other teeth serve to totally cover the outer surface of each breaker drum 14 and thereby provide a wear resistant shroud.

The teeth 16 are releasably mounted in each drum 14 so that in the event of breakage, broken teeth can be easily replaced.

The releasable mounting of teeth 16 can be clearly seen in Figures 2, 3 and 4. Each tooth 16 is provided with a spigot 18 which, in use, seats in a pocket 19 formed in a breaker drum 14. There are close tolerances in the dimensions of the spigot 18 and pocket 19 so that the spigot 18 is a close fit within the pocket 19. The length of the spigot 18 and depth of the pocket 19 are chosen so that the length of abutting faces 20 is sufficient to accommodate the working loadings. Additionally, the longitudinal axis of each pocket is offset but parallel to a radius so that the trailing face 20a of each pocket forms an acute angle α with the periphery of the drum. Such an arrangement helps the teeth to accommodate working loadings and resist withdrawal of the spigot during use by said working loadings.

In order to provide resistance to withdrawal of the spigot 18 of a tooth from a pocket, the spigot is provided with a resiliently deformable projection 25 which extends into a groove 26 when the spigot 18 is fully inserted into the pocket. Conveniently the projection 25 is made of a resilient plastics material such as polyurethane. The

projection 25 is preferably made hollow a shown so as to facilitate inward deformation of the projection when the spigot 18 is forced into the pocket 19. To facilitate insertion without damage to the projection the mouth of the pocket is provided with a chamfered edge 27.

As shown in Figure 4 the leading face 16b of each tooth is provided with a rebate 16c which receives the rearward marginal portion 16d of the cover portion 16a of the preceding tooth (in the direction of rotation of the drum). Accordingly when all teeth in a circumferential group of teeth are inserted into the drum, the overlapping nature of the teeth serves to restrain withdrawal of teeth from the drum, particularly if the drum is rotated in the opposite direction to which it normally runs for sizing, as for instance when attempting to clear a blockage.

In order to enable removal of teeth within a circumferential group, at least one tooth (not shown) is provided which has a cover portion 16a which does not enter the rebate of the succeeding tooth 16, for instance the cover portion 16a may be provided with a recess. This tooth is withdrawn first and then successive teeth (in the direction of normal rotation of the drum) may then be removed.

An alternative construction for interlocking neighbouring teeth is illustrated in Figure 8 wherein the rebate 16c is replaced by a projecting lug 16f which has a curved face 16g. The lug 16f extends over the width of the tooth. The rearmost edge of the neighbouring tooth cover portion is provided with a complimentary recess 16h which , in use, overlaps the lug 16f. In use, when a tooth engages mineral to be broken, a turning force is created which tends to urge the rearmost edge of each cover portion toward the periphery of the drum. Accordingly, during use, recess 16h is urged into contact with the lug 16f and thereby discourages ingress of dirt particles. This is advantageous since ingress of dirt particles could encourage a given tooth to lift away from the drum and thereby run the danger of the tooth pulling out of the pocket 19 during use.

In order to lock the teeth in a given annulus to one another, in the embodiment of Figure 8 one of the teeth is omitted and replaced by a locking member 60. The locking member 60 includes a cover portion 16a and spigot 18 and also includes a plate 61 which overlaps a neighbouring cover portion 16a. The plate 61 includes a recessed bore 63 through which passes a bolt 64 which is threadedly received in a threaded bore formed in the cover portion of the preceding tooth. Accordingly, the locking member 60 is positively locked in position to one tooth construction and interlocks with the other one so that it has to be removed before any of the teeth forming the annulus can be removed.

In the embodiment in Figure 8, the shape of pocket 19 and spigot 18 is changed from having a circular terminal end to having a flattened shape. The resilient projection 25 is also positioned further away from the terminal end. The change in shape is advantageous in that it provides a greater thickness and thereby strength of material between the terminal end of the pocket and the internal periphery of the drum. The change in position of the projection 25 is advantageous as it enables a greater length of the spigot to be inserted into the pocket before the projection 25 enters. This stabilises the tooth construction during insertion and thereby facilitates its insertion.

The teeth shown in Figures 4 and 5 are conveniently made in one piece from a suitable material bearing in mind the type of material to be sized.

An alternative construction of tooth is illustrated in Figures 6 and 7 which is basically a tooth constructed from two components viz. a spigot 40 and a tooth portion 41. Such a construction enables different materials to be adopted for the spigot 40 and tooth portion 41. In this respect the tooth can be designed to cope with a wide variety of materials which are to be sized e.g. the spigot 40 can be made from a material which can withstand high shear loadings whilst the material of the tooth portion 41 may be chosen so as to have good wear characteristics.

In the tooth construction illustrated in Figures 6 and 7 the upper portion of spigot 40 is received in a pocket 42 formed within the tooth portion 41. Preferably the upper portion of spigot 40 is a tight fit within the pocket 42, for instance the tooth portion 41 is heat expanded and then contracted onto the spigot.

The tooth portion 41 and spigot are formed so as to define pockets 43 which are filled with a suitable weld. Additionally, apertures 44 may be provided which also provide sites for welding the tooth portion 41 to the spigot 40.

The pockets 19 in each drum 14 are preferably provided by assembling each drum from a series of tooth support rings 30 which have a series of recesses or slots formed in one face and an annular groove 26 formed in the opposite face. Accordingly, when rings 30 are in abutment, pockets 19 are formed. The rings 30 are keyed onto a shaft 35 and the angular position of the key ways on different rings is indexed in relation to the slots so as to provide the desired degree of offsetting between adjacent teeth in a longitudinal group of teeth to provide the longitudinal group with the desired helix.

Preferably, one face of each ring is provided with a shallow chamfer 38 so as to enable a wedge to be forced between adjacent rings for facilitating separation of rings.

In the illustrated embodiment, the rings are prevented from axial displacement by being held in abutment between a shoulder 39 formed on the shaft 35 and a removable collar 37.

It is envisaged that the tooth portion of teeth 16 may be shaped as desired to cope with different requirements in sizing. For instance, the tooth portion may be divided to provide two or more separate teeth for each spigot.

By way of illustration, a tooth construction is illustrated in Figure 9 wherein two teeth 16c of different heights are provided on a cover portion 16t. The difference in heights of the teeth is desirable in certain circumstances in order to create agitation of the mineral being broken. In Figure 10, a plurality of teeth 16k are provided on the cover

portion. These teeth may be arranged in one or more circumferentially extending rows on each cover portion. Such a construction enables a high density of teeth to be provided on the surface of the drum. Each cover portion is provided with a protrusion 16m which enters a recess 16n of a succeeding tooth when in use.

It has been found that the mode of mounting a tooth in a breaker drum as described above is particularly suitable for sizing of material to below 2 inches, although obviously larger sizing may be achieved if desired.

In the tooth construction illustrated in Figures 4, 6, 9 and 10 the cover 16a extends rearwardly from its associated tooth portion toward the succeeding tooth construction in order to cover the portion of the drum lying therebetween. It is envisaged that the cover portion could terminate adjacent to the rearward end of the tooth portion and project forwardly therefrom toward the preceding tooth construction.

CLAIMS

1. A tooth construction for a mineral breaker having at least one breaker drum, the tooth construction including a cover portion for extending over a portion of the drum surface, a spigot for releasable retention in a complimentary pocket formed in the drum, and at least one breaker tooth protruding from said cover portion.

2. A tooth construction according to Claim 1 wherein the cover portions have complimentary interlocking formations formed at their leading and trailing edges so that when arranged in groups extending circumferentially about the drum, the teeth constructions interact to restrain radial withdrawal of a given tooth construction.

3. A tooth construction according to Claim 2 wherein the interlocking formations comprise a rebate at one edge and a protrusion at said other edge for reception in the recess of a neighbouring tooth construction.

4. A tooth construction according to Claim 3 wherein the protrusion is located at said leading edge.

5. A tooth construction according to Claim 4 wherein in cross-section, the protrusion has a curved profile.

6. A tooth construction according to any preceding Claim wherein the spigot includes a resilient projection for retaining the spigot within a pocket.

7. A tooth construction according to any preceding Claim wherein the spigot and cover portion are integrally formed together.

8. A tooth construction according to any of Claims 1 to 6

wherein the spigot and cover portion are separate components joined together.

9. A tooth construction substantially as described with reference to any preceding claim.

10. A breaker drum for a mineral breaker, the breaker drum including a plurality of teeth constructions according to any preceding claim.

11. A breaker drum according to Claim 10 wherein the drum is composed of a plurality of annular support rings mounted side by side in face to face contact.

12. A breaker drum according to Claim 11 wherein a series of recesses are formed in one face so as to form said pockets when in contact with a neighbouring annular support ring.

13. A breaker drum according to Claim 10, 11 or 12 wherein each pocket has a trailing face which is located at an acute angle with respect to the circumference of the drum.

14. A breaker drum according to Claim 13 when dependent on Claim 6 wherein the other face of each aannular support ring is provided with an annular groove for co-operation with said resilient projection.

15. A breaker drum according to any of Claims 10 to 14 wherein for each circumferential group of teeth constructions there is provided a locking member located between a pair of teeth constructions, the locking members being arranged to interlock with one tooth construction of said pair and being arranged to be releasably secured to the other tooth construction of said pair.

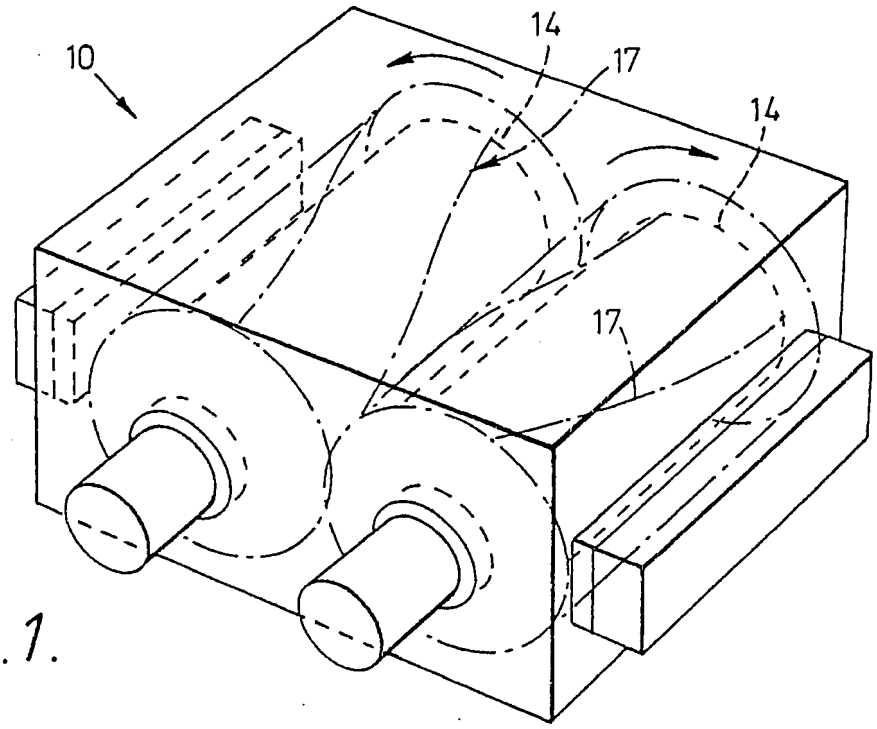
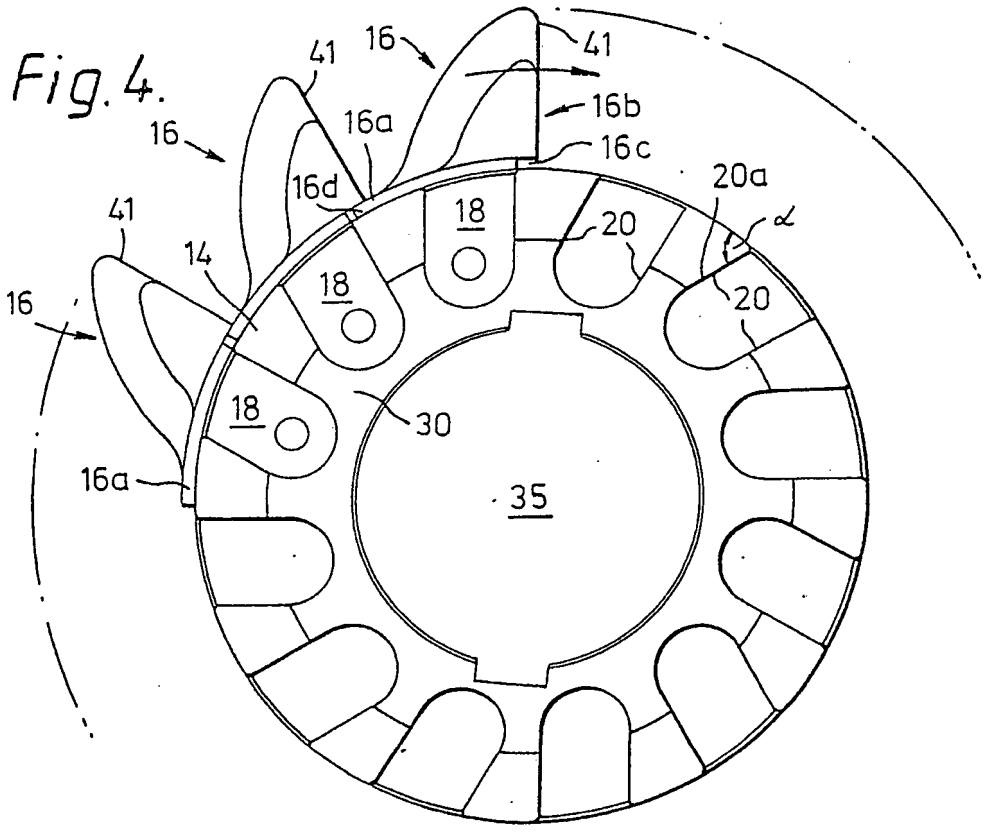


Fig.1.

Fig.4.



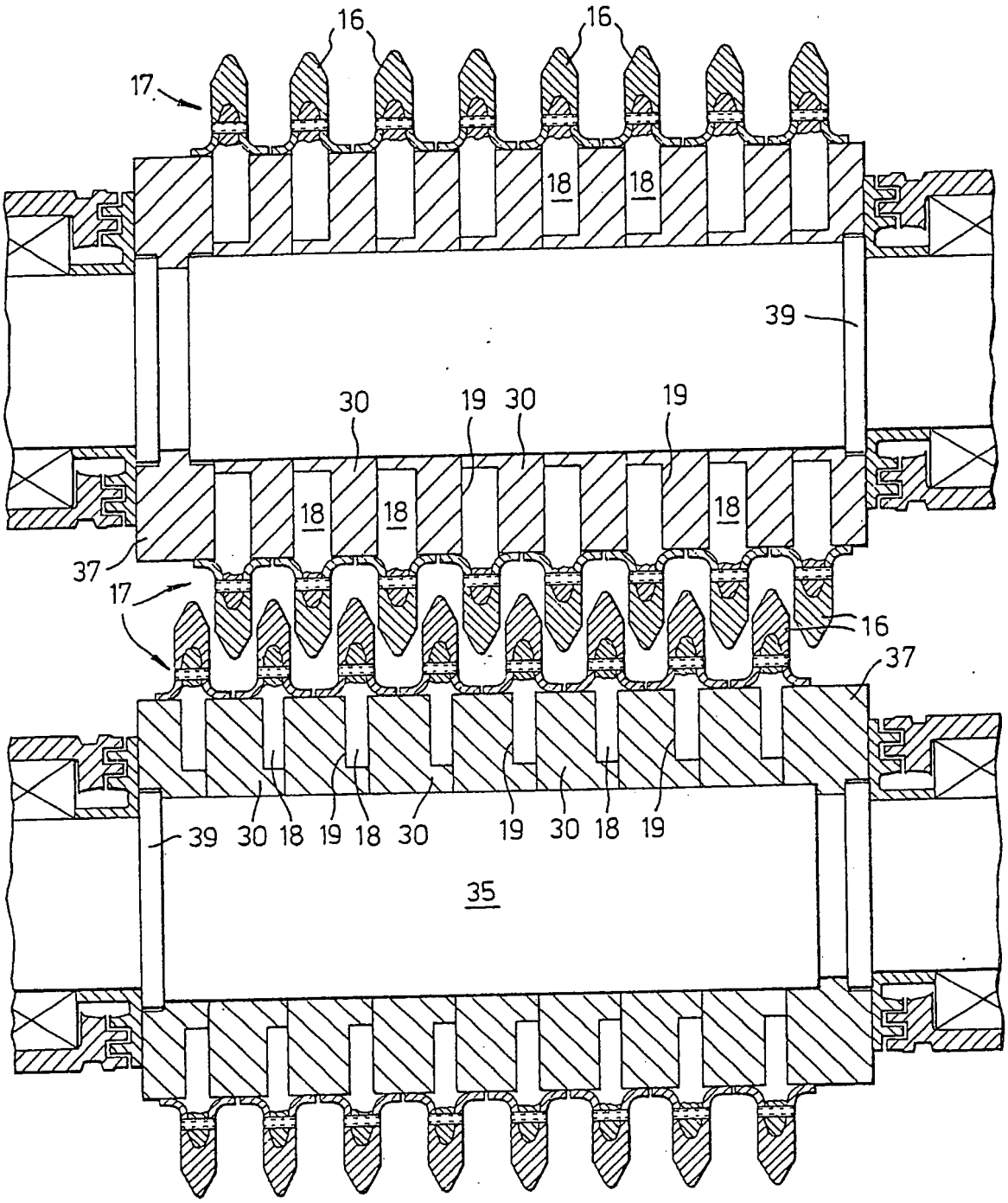


Fig. 2.

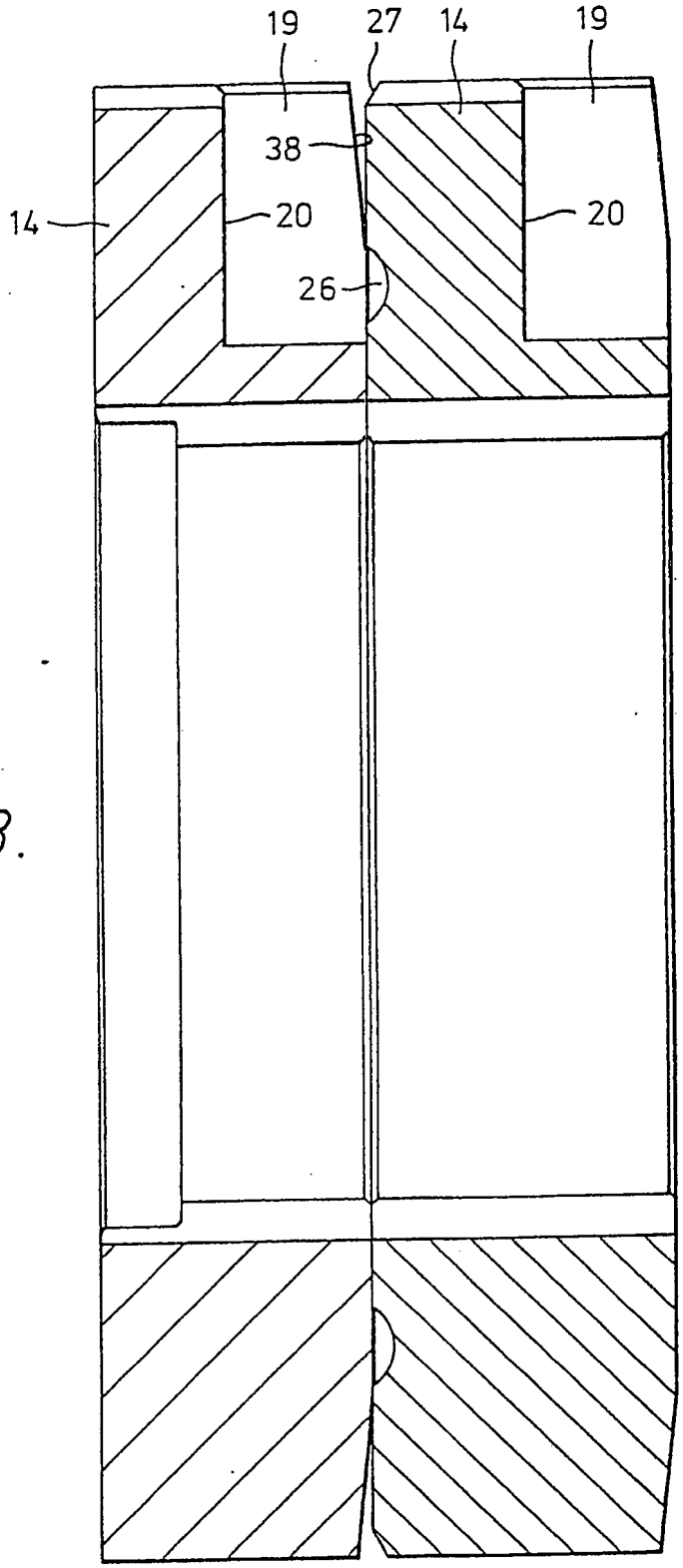


Fig. 3.

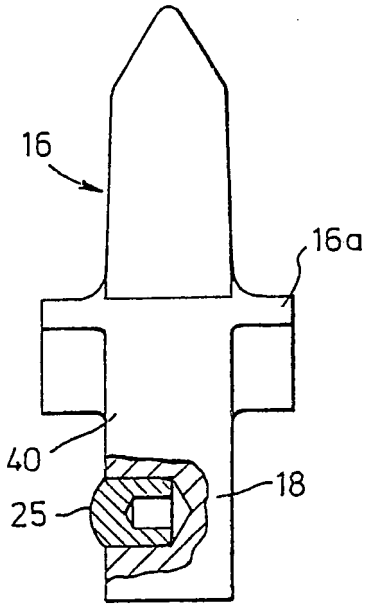


Fig. 5.

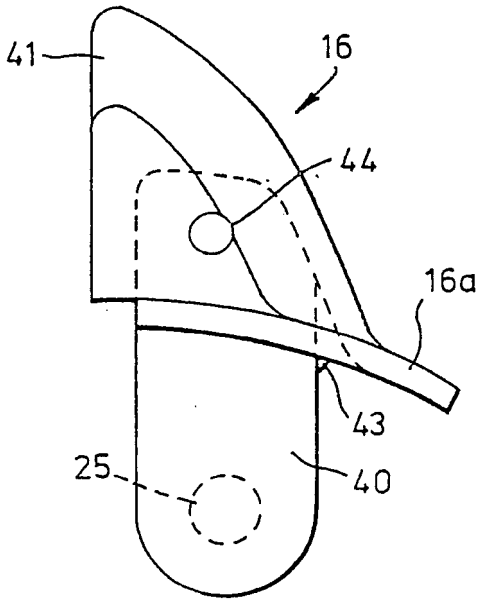


Fig. 6.

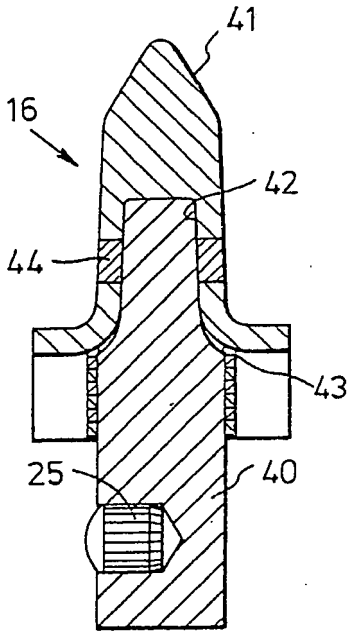


Fig. 7.

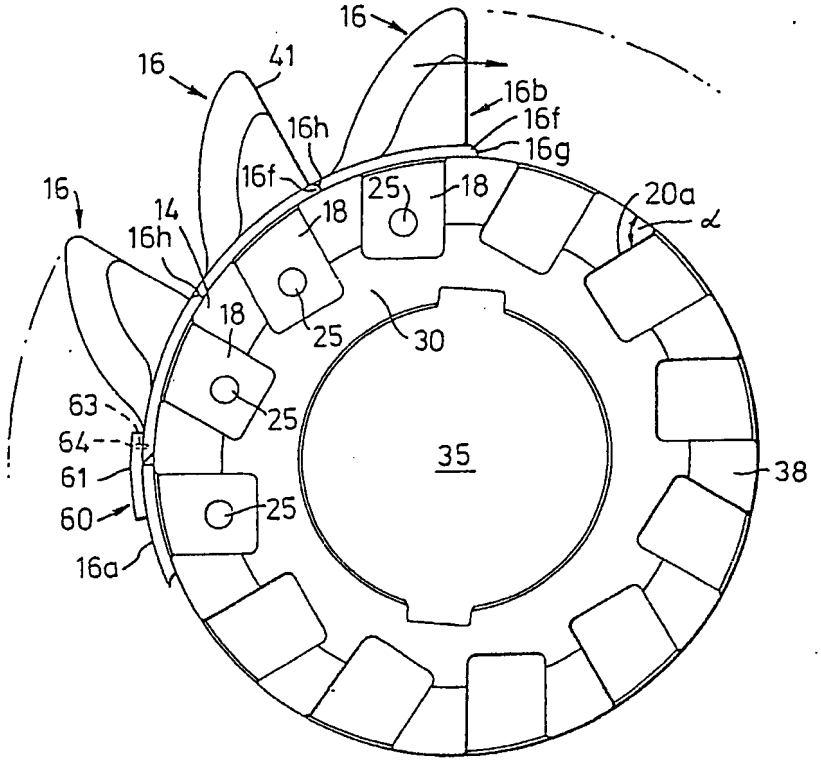


Fig. 8.

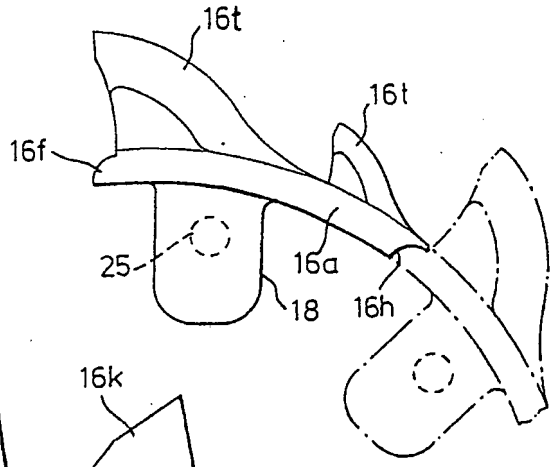
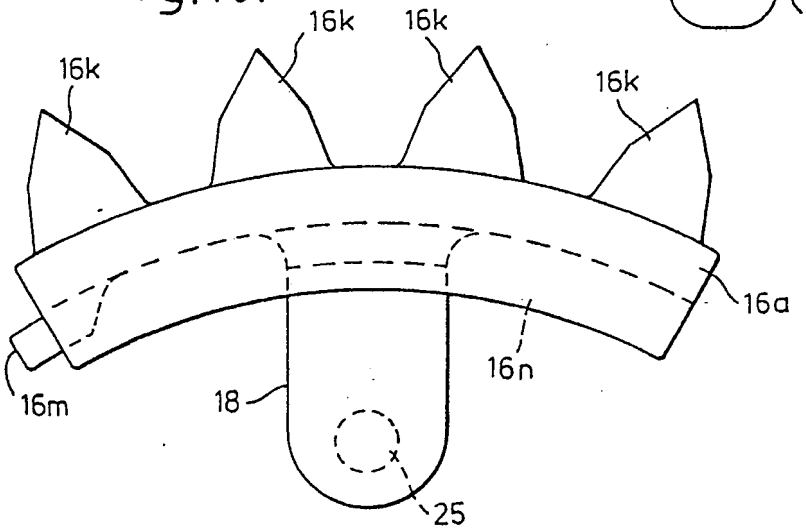


Fig. 9.

Fig. 10.



INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 83/00062

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[3]: B 02 C 4/08; B 02 C 4/30; B 02 C 18/28

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC[3]	B 02 C

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category *	Citation of Document, [16] with indication, where appropriate, of the relevant passages [17]	Relevant to Claim No. [18]
Y	DE, B, 1221081 (SCHÜCHTERMANN & KREMER-BRAUN) 14 July 1966 see column 2, lines 31-48	1,10
Y	US, A, 1604744 (FINGER) 26 October 1926 see page 1, lines 56-67	1,10
Y	DE, C, 137974 (APLERBECKER HÜTTE) 30 December 1902 see pages 1 and 2	1,2,10
Y	FR, A, 461899 (BOSC) 13 January 1914 see page 2, lines 23-55	1,2,10
P	GB, A, 2088746 (M.M.D. DESIGN) 16 Juni 1982 see figure 2	1,10
A	DE, C, 116068 (CONDULA) 8 December 1900 see pages 1 and 2	1,11 ./.

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IV. CERTIFICATION

Date of the Actual Completion of the International Search [3]	Date of Mailing of this International Search Report [3]
14th June 1983	01 JUIL. 1983
International Searching Authority [1]	**Signature of Authorized Officer [20]**
EUROPEAN PATENT OFFICE	G.L.M. Kruydenberg

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, 16 with indication, where appropriate, of the relevant passages 17	Relevant to Claim No 18
Y	GB, A, 1206313 (COAL INDUSTRY) 23 September 1970 see page 2, lines 22-29	1,6,10
Y	GB, A, 2041040 (HALL & PICKLES) 3 September 1980 see page 2, lines 65-80	1,6

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 83/00062 (SA 4846)

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Patent document cited in search report	Publication date	Patent family member(s)		Publication date
DE-B- 1221081		None		
US-A- 1604744		None		
DE-C- 137974		None		
FR-A- 461899		None		
GB-A- 2088746	16/06/82	None		
DE-C- 116068		None		
GB-A- 1206313	23/09/70	None		
GB-A- 2041040	03/09/80	FR-A,B	2448030	29/08/80
		DE-A,C	3002807	07/08/80
		AU-A-	5434180	07/08/80
		US-A-	4261619	14/04/81
		CA-A-	1141401	15/02/83

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